

*Cruise Report*  
*Belgica 08/13a*  
***BiSCOSYSTEMS***  
*Gulf of Biscay*



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## TABLE OF CONTENTS

1.	Cruise schedule & staff.....	3
1.1	Schedule.....	3
1.2	Coordination.....	3
1.3	Scientific staff.....	3
2.	Framework and objectives.....	4
2.1	Framework .....	4
2.2	Objectives .....	5
3.	Working area .....	6
4.	Operations.....	7
4.1	Overview of activities .....	7
4.1.1	Multibeam survey.....	7
4.1.2	Seismic survey .....	9
4.1.3	CTD measurements.....	10
4.1.4	ROV survey .....	12
4.1.5	Seafloor sampling: boxcores .....	15
4.2	Operational Report .....	16
5.	Geological investigations: preliminary results.....	25
5.1	High-resolution 2D seismics .....	25
5.2	ROV observations .....	27
5.3	Boxcore sampling .....	38
6.	Class@oceans .....	42
7.	Data storage .....	43
8.	Acknowledgements .....	44

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# 1. Cruise schedule & staff

## 1.1 Schedule

Departure: Brest (F)	28.05.2008, at 16.00h.	
Arrival: La Coruña (ES)	06.06.2008, at 11.00h.	

Belgica 08/13a

## 1.2 Coordination

Chief scientist: Prof. Dr. Jean-Pierre HENRIET  
Renard Centre of Marine Geology (RCMG),  
Ghent University, Belgium

Co-chief scientist: Lies DE MOL  
Dr. David VAN ROOIJ (*shorebased*)

## 1.3 Scientific staff

Prof. Dr. Jean-Pierre HENRIET	UGent, RCMG
Dr. David VAN ROOIJ	UGent, RCMG ( <i>shorebased</i> )
Willem VERSTEEG	UGent, RCMG
Lies DE MOL	UGent, RCMG
Hans PIRLET	UGent, RCMG
Frédéric QUEMMERAI	IFREMER
Dr. Jens GREINERT	UGent, RCMG
Ing. Dries BOONE	UGent, RCMG
Ing. Jeroen VERCRUYSSSE	UGent, RCMG
Ing. Koen DE RYCKER	UGent, RCMG
Ing. Arne BAEYENS	UGent, RCMG

## 2. Framework and objectives

### 2.1 Framework

The geophysical and sedimentological research programme of the Belgica cruise 2008/13a frames into several international and national projects:

- **ESF EUROCORES EuroDiversity project MiCROSYSTEMS ‘Microbial diversity and functionality in cold-water coral reef ecosystems’ (2006-2009)**

Study of microbial diversity and functionality in cold water coral reefs.

- **EC FP6 Integrated Project HERMES ‘Hotspot Ecosystem Research on the Margins of European Seas’ (2005-2009)**

RCMG focuses on geosphere controls on ecosystem hotspots in mound provinces and on the dynamic interaction between slope sedimentary processes, carbonate mounds and coral banks.

- **Ph.D. project of the Flemish IWT**

- L. De Mol: “Mound-4D: an ROV supported study of the 4D architecture of carbonate mounds”

## 2.2 Objectives

Within the framework of the HERMES (EC FP6) and MiCROSYSTEMS (ESF) projects, this area was surveyed using multibeam and high resolution seismic profiling. Based on the results of this site survey, the ROV 'Genesis' was deployed to carry out detailed mapping of these deep-water "hotspots". Also the hydrography and sediment dynamics of this area were studied with respect to the steering of the present ecosystems.

**Multibeam survey:** high-resolution mapping of two upper canyon heads and the adjacent open slopes. The results of the mapping determined the ROV dive sites and the seismic profiling grid.

**High-resolution seismic profiling:** investigation of the stratigraphic framework and the sedimentary environment. The tracks for the profiling were dependent of the results of the multibeam survey (slope, seabed features...).

**Hydrography:** 4 CTD casts were planned on several water depths. First of all to calibrate the multibeam data, secondly to provide more insight in the local hydrography within the canyons. The locations of the CTD casts varied depending on the multibeam results.

**ROV operations:** visual and acoustic observation and mapping of seafloor ecosystems, targeted sampling.

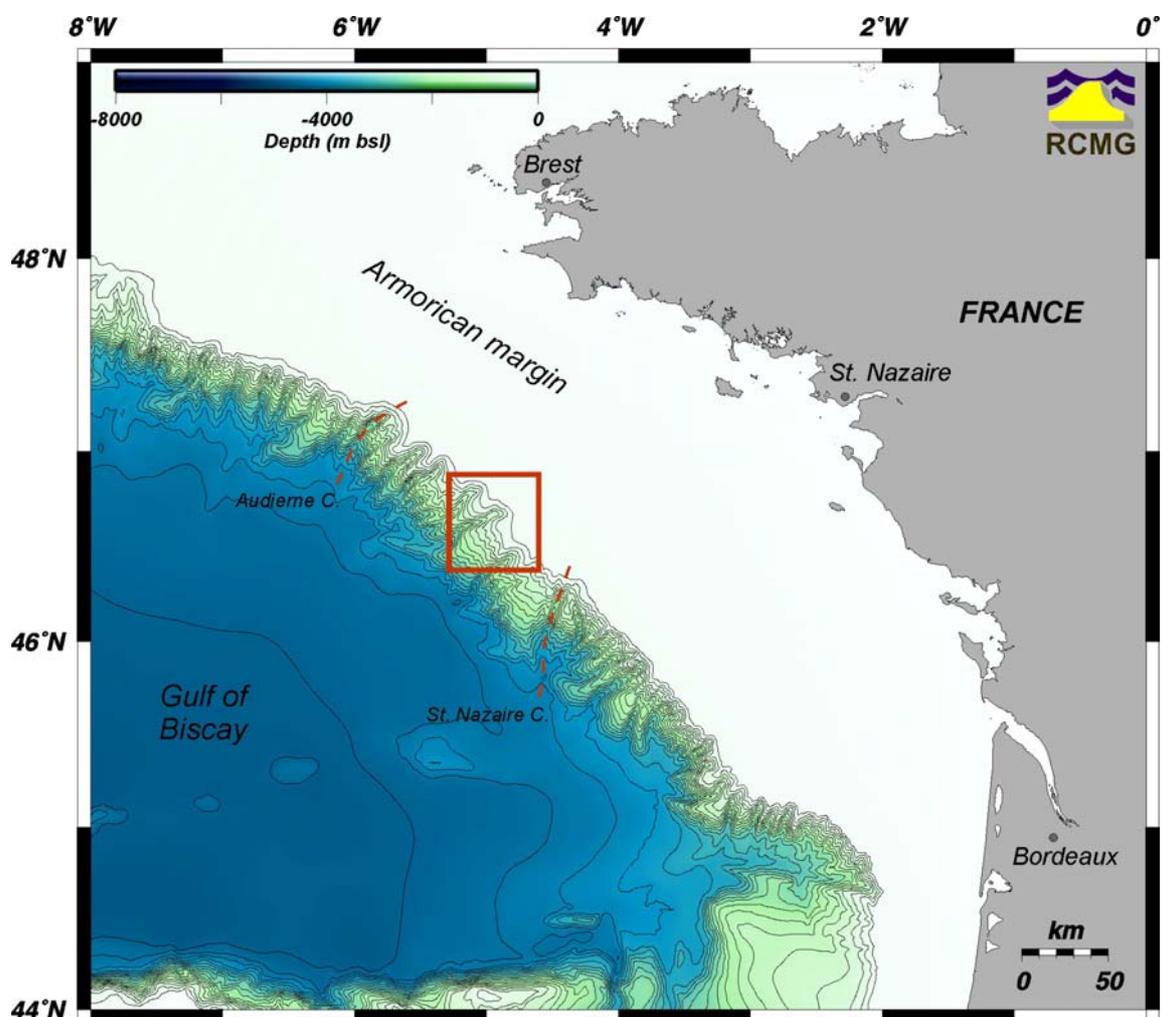
**Seabed sampling:** boxcore sampling of the ROV-investigated sites, targeted ROV sampling.

This campaign was executed in cooperation with the department DRO-DEEP/LEP of IFREMER (France) and the French Marine Protected Areas Agency (France).

### 3. Working area

The study area is located on the Armorican Margin, at water depths between 250 and 1500 m depth (Figure 1) within the area: 5°50' W/4°50' W/46°30' N/47°10' N.

The area between the Audieme and St. Nazaire canyons (Gascogne area) along the French Armorican margin was one of the areas where the "massifs coralliens" were described for the very first time (Le Danois, 1948). A compilation of historical studies which have retrieved deep-water corals indeed indicate this area as a high potential for coral growth (Réveillaud *et al.*, 2008).



**Figure 1:** Working area in the Gulf of Biscay (GEBCO bathymetry).

## 4. Operations

### 4.1 Overview of activities

#### 4.1.1 Multibeam survey

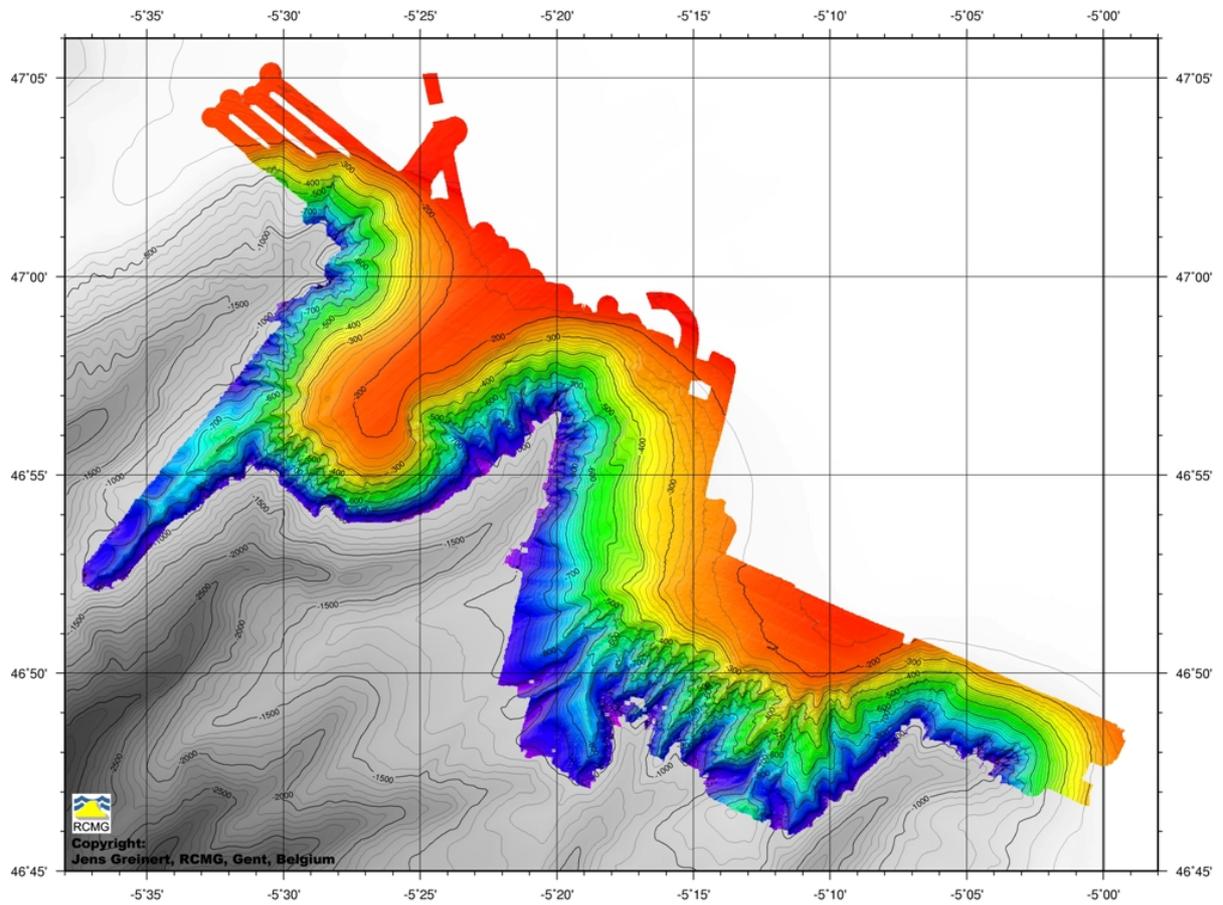
The multibeam echosounder used during the BiSCOSYSTEMS cruise is the Simrad EM1002 system from the Ministry of Economical Affairs, installed permanently on the Belgica. Standard procedures were chosen for its application. Before leaving the port of Brest, the draft of the ship was measured at four locations, resulting in the average value of 5.19 m. This value was entered in the settings of the multibeam system.

During the night from 28th to 29th May it was planned to sail calibration lines at a ~150 m deep and mostly flat site prior to the arrival in the working area. A CTD cast (CTD 02) was performed in the calibration area to get a current sound velocity profile. However due to technical problems, caused by failing to connect the UNIX workstation to the SIMRAD electronics, the calibration was postponed until the problems could be overcome and we headed on to the working area. After arrival in the working area early 29th May, a working connection between the UNIX workstation and the SIMRAD electronics could be established after both systems were switched off and on again (SIMRAD electronics was first switched on). Another CTD (CTD 03) recording a valid sound velocity profile from the working area was deployed and the processed data were loaded into the SIMRAD software. Short surveys prior to the first ROV dive showed that a calibration was not urgently needed, and thus was not performed during the entire cruise. Both, roll and pitch offset were set to 0 before the first data were recorded.

The sound velocity next to the transducers was manually set to 1509 m/s (an automatic update of the current sea surface sound velocity did not work despite the system was switched on). The sound velocity profile from CTD 03 was also used during data processing with MB Systems (Vers. 5.7). The line spacing during multibeam surveys was between 800 and 1000 m (thus the swath width varied with depth from 70° to 45°). To help the system to find the bottom in greater depth the block depth was sometimes manually set to 300 or 500 m. Survey speed was between 4 and 6 knots depending on water depth and wave conditions.

The bathymetric information of the recorded .all files was extracted as xyz-data with MB Systems and data editing occurred in Fledermaus parallel to data recording. One additional LINUX PC with MB-System and another Windows PC for Fledermaus was installed at the bridge and connected to the ships network. Data were transferred via ftp from one computer to another. Bathymetric maps were made with GMT (Vers. 4.2.1) after

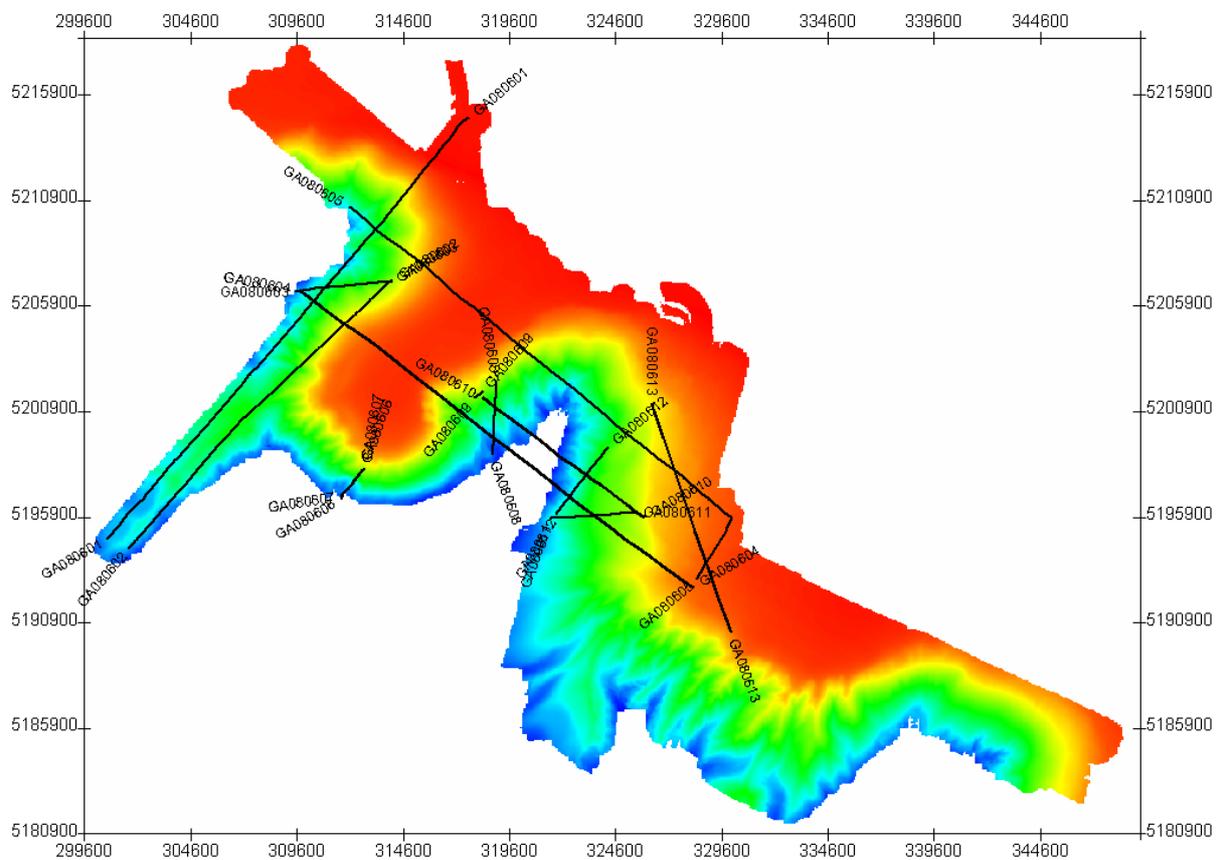
data editing. Various grid-sizes were used (30 to 5m) depending on the displayed map size and water depth.



**Figure 2:** Multibeam map (Simrad EM1002 system on board of R/V Belgica).

### 4.1.2 Seismic survey

About 135 kilometers of seismic data were collected (13 2D lines) in the study area. Most of the seismic profiles are single channel surface sparker lines, acquired with a SIG sparker source (120 electrodes). The sparker was triggered every 3 s reaching 500 J energy. The sampling frequency was set at 8 kHz and a record length of 2500 ms TWT was used. The velocity of the ship during seismic work was about 3 knots. During this work, R/V Belgica operated on electrical engines for noise reduction.

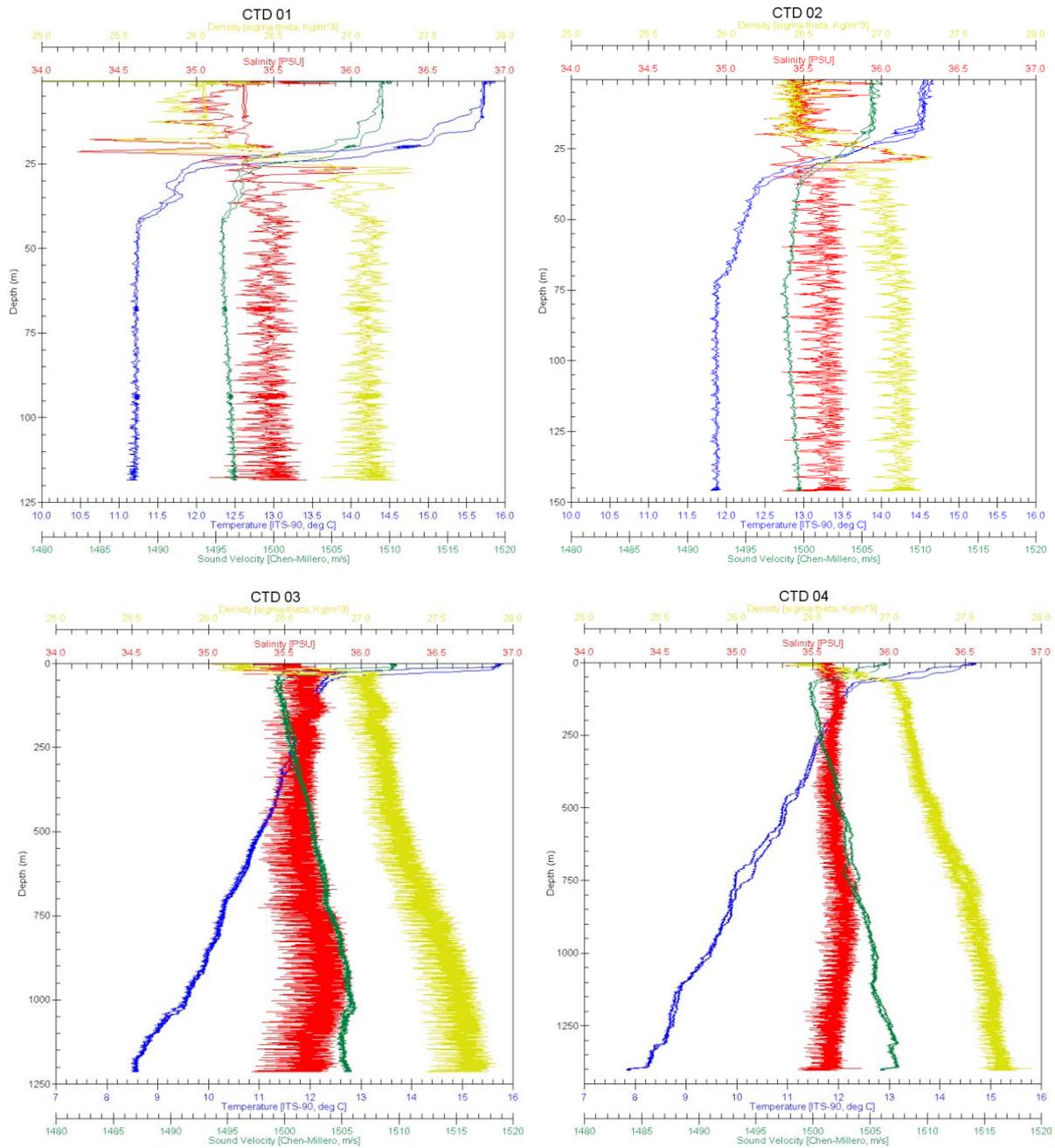


**Figure 3:** 2D seismic navigation (UTM 30/WGS84).

### 4.1.3 CTD measurements

CTD casts (Seacat 19; Sea-Bird Electronics) were generally performed to obtain an up to date sound velocity profile in the multibeam survey area. One test CTD cast was performed shortly after leaving Brest and the first ROV test dive (CTD 1; position 47°10.659' N / 5°23.345' W). CTD 2 was lowered to get the sound velocity profile in the calibration area at about 150 m (position 47°46.632' N / 5°11.608' W).

The third CTD was intended to get the sound velocity but also to provide more insight in the local hydrography within the canyons. Two CTD casts were taken in water depths of 1250 m and 1450 m at two different locations in the Guilvinec canyon for this purpose (46°51.990' N / 5°31.768' W (CTD 03) and 46°54.536' N / 5°21.262' W (CTD 04)). Data processing was done with the Sea-Bird Data Processing software (Vers. 7.12) which also allows to calculate the sound velocity and do an averaging of the data for each meter water depth. The same software was used for plotting the data in Figure 4.



**Figure 4:** Plotted are the 1 m averaged data from CTD 1 to 4. The high noise level in the salinity and density data is due to the noise conductivity data because a CTD without pump was used.

#### 4.1.4 ROV survey

The RCMG acquired a Sub-Atlantic Cherokee-type ROV "Genesis", with TMS and shipboard winch. This winch hosts a reinforced cable of 1600 m which can bring the TMS and ROV to a safe depth prior to ROV launch (with a maximum tether of 100 m). The winch cable is connected to a pilot control interface which was installed in the laboratory container. This encompasses the physical control of the ROV and its instruments, as well as the observation (and navigation cameras). 4 cameras and 1 still camera were active: one on the TMS (ROV launch & re-entry control), a backward looking within the ROV (for TMS re-entry and tether inspection) and the two forward-looking black & white and colour (with overlay) cameras. An overlay on the screen with navigation control information could be put on an arbitrary camera display. The main sampling tool on the ROV is the controlled grab arm and a deployable tray in which samples can be stored. The ROV also contains a depth control, an altimeter and a side-looking sonar for detection of seabed objects.

Positioning of the TMS and ROV was done through the GAPS positioning system (IXSEA). This Global Acoustic Positioning System, GAPS, is a portable Ultra Short Base Line (USBL) with integrated Inertial Navigation System (INS) and Global Positioning System (GPS). The GAPS was deployed at the side frame (Davit) and a transponder fixed on the TMS and on the ROV, resulting in the position of the Belgica, TMS and ROV. Navigation from the GAPS software is stored in raw format. During the deployments, the ship's, TMS and ROV navigation was also recorded through the OFOP software (J. Greinert) and displayed in 3D in Fledermaus (Figure 5).

During ROV survey, the control is performed by the pilot and the PI scientist (scientist, co-pilot/navigator), assisted by another shipboard scientist and contact with the bridge is held. Propulsion of the ship remained diesel which enables to handle the ship in a very controlled manner, even though dynamic positioning is not available.





**Figure 6:** Pictures demonstrating the ROV deployment and operational environment.

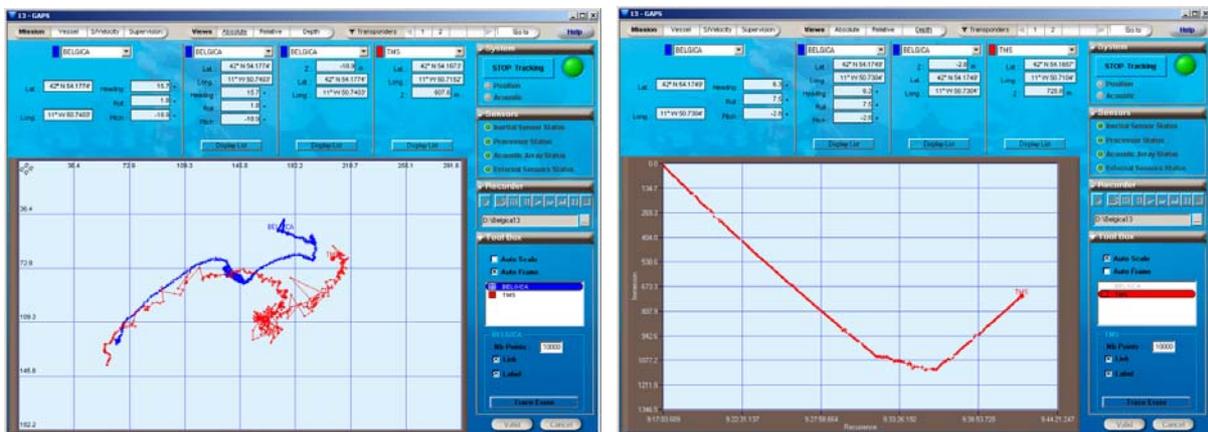
### 4.1.5 Seafloor sampling: boxcores

Based on the ROV survey we were able to select two interesting areas for boxcore sampling. The first area is located on the south flank of the Guilvinec canyon in water depths of 280 m where small mounds/ridges were recorded on the multibeam data, and which appeared to be covered by death coral rubble (ROV dive 03). The second area is the north flank of the Guilvinec canyon where different facies with coral rubble as well as living species occur. The goal was to determine these different facies and to identify coral species that lived and still live on the site.

For every boxcore, samples from different locations and/or subcores (if possible) have been taken for the purpose of sedimentological analyses. Some pieces of dead coral rubble have been collected for U/Th dating (in cooperation with LSCE, Gif-sur-Yvette, France).

Living species were collected and stored on formol by F. Quemerrais (IFREMER) for morphologic studies. Sponge specimens were collected and stored on ethanol upon request by J. Réveillaud (UGent, Marine Biology Section) for phylogenetic / genomic studies.

For boxcores B08-1305-bc and B08-1306-bc the transponder of the TMS was installed on the boxcore so that a more accurate position was obtained (Figure 8).



**Figure 7:** Screenshots of the GAPS software used to obtain a more accurate position of the boxcore: the absolute position of the ship and the boxcore (left) and the depth (right).

## **4.2 Operational Report**

It is worth noting that the time used in this cruise report is the Belgian Summer time (BRAVO TIME = UTC + 2 hours). On the seismic and ROV logsheets UTC time was used.

### **Sunday 25.05.2008**

- 14:30 Arrival of a part of the shipboard scientific crew (Lies De Mol and Jens Greinert).
- 16:30 Arrival of the rest of the shipboard scientific and technical crew (Jean-Pierre Henriet, Willem Versteeg, Hans Pirlet, Koen De Rycker, Jeroen Vercruyssen, Dries Boone and Arne Baeyens).
- 17:00 Safety briefing.
- 17:30 Explanation of the CTD by Joan Backers (BMM).

### **Monday 26.05.2008**

- 09:00 Unpacking all RCMG material and installation of seismic equipment.
- 10:00 Delivery of 'new' SIG sparker.
- 11:00 Scientific meeting (discussing the program and planning) with Jean-Pierre Henriet, Lies De Mol, Jens Greinert and Hans Pirlet.
- 11:15 Delivery of ROV container.
- 14:00 Start ROV installation.
- 16:00 Meeting of Jean-Pierre Henriet and Jens Greinert with French colleagues, in charge of the implementation of Marine Protected Areas in French waters.

### **Tuesday 27.05.2008**

- 08:00 Scientific meeting with Ifremer.
- 08:30 Continue ROV installation.
- 10:00 Press meeting.
- 12:30 Problem with the ROV.
- 14:00 Visit to Ifremer (Jean-Pierre Henriet, Lies De Mol, Jens Greinert and Hans Pirlet).
- 19:00 Briefing with the crew, Jean-Pierre Henriet and Lies De Mol.
- 20:00 Technical meeting in the wardroom.
- 23:30 Problem solved with the ROV.

**Wednesday 28.05.2008**

Meteo: Clouded weather with 4-5 beaufort SW wind. Moderate Atlantic swell.

08:30 Continue ROV installation.

16:00 Departure of R/V Belgica from the harbour of Brest towards the Bay of Douarnenez (test area for the ROV).

20:00 Test dive of ROV Genesis in the Bay of Douarnenez. Problems with the instrumentation of the ROV.

21:35 ROV back on deck and start transit to the calibration area for the multibeam.

**Thursday 29.05.2008**

Meteo: Clouded weather with 2-4 beaufort S wind. Moderate Atlantic swell.

02:30 Arrival at the calibration area.

02:35 CTD 01 in water at 47°10.659' N / 5°23.345' W

05:00 Multibeam calibration failed because of a problem with the multibeam.

05:30 Transit to the new area for multibeam calibration.

08:15 Arrival at the calibration area.

08:25 CTD 02 in water at 47°46.632' N / 5°11.608' W

09:45 Multibeam calibration.

09:47 Start of multibeam line 1.

11:25 Sparker and streamer in the water and testing of equipment on test line.

11:28 Start of multibeam line 2.

11:30 Start of line TEST, heading 316° (speed 3.6 knots).

11:34 Streamer out.

11:36 Streamer in.

11:39 Good signal for seismics.

11:53 Change heading to 85.6° (speed 3.3 knots).

12:02 End of line TEST.

12:07 Start of multibeam line 3.

12:45 End of multibeam calibration and transit to the study area.

13:10 Start of multibeam line 4.

13:34 Start of multibeam line 5.

13:51 Start of multibeam line 6.

14:38 Start of multibeam line 7.

15:02 Start of multibeam operations in the study area with line 8 (speed 6 knots).

16:25 CTD 03 in water at 46°51.990' N / 5°31.768' W (depth: 1250 m).

17:10 CTD 03 back on deck.

17:15 'Abandon ship' exercise.

17:30 Continue multibeam operations (speed 6 knots).

18:39 Start of multibeam line 9.  
20:01 Start of multibeam line 10.  
21:36 Start of multibeam line 11.  
21:56 Start of multibeam line 12.  
23:38 Start of multibeam line 13.

**Friday 30.05.2008**

Meteo: Clear but slightly clouded, warm weather with 3-4 beaufort variable wind, changing to N in the afternoon. Moderate Atlantic swell.

00:00 Continue multibeam operations (speed 6 knots).  
00:30 Start of multibeam line 14.  
01:28 Start of multibeam line 15.  
02:32 Start of multibeam line 16.  
03:38 Start of multibeam line 17.  
05:39 Start of multibeam line 18.  
06:40 Start of multibeam line 19.  
07:33 Start of multibeam line 20.  
08:08 Start of multibeam line 21.  
09:18 Start of multibeam line 22.  
10:46 Start of multibeam line 23.  
12:02 Start of multibeam line 24.  
12:13 Start of multibeam line 25.  
13:22 Start of multibeam line 26.  
13:30 Technical meeting in the wardroom about the ROV.  
13:40 Start of multibeam line 27.  
14:52 Start of multibeam line 28.  
15:00 Some of the ROV instrumentation problems are solved.  
16:17 Start of multibeam line 29.  
17:32 Start of multibeam line 30.  
17:39 Start of multibeam line 31.  
18:45 Start of multibeam line 32.  
19:59 Start of multibeam line 33.  
21:00 Switch from diesel to electric propulsion.  
21:15 Seismic equipment into the water.  
21:15 Start of simultaneous multibeam/seismic survey. Start of line GA080601, heading 228° (av. speed 4.0 knots).  
21:50 Start of multibeam line 34.  
23:27 Start of multibeam line 35.

**Saturday 31.05.2008**

Meteo: Clear, warm weather with 3-4 beaufort N wind, becoming clouded in the evening.  
Gentle to moderate Atlantic swell.

00:46 Start of multibeam line 36.  
00:55 End of line GA080601.  
01:10 Start of line GA080602, heading 39° (av. speed 4.9 knots).  
01:44 Start of multibeam line 37.  
02:49 Start of multibeam line 38.  
03:03 End of line GA080602.  
03:18 Start of line GA080603, heading 262° (av. speed 4.3 knots).  
03:51 End of line GA080603.  
03:54 Start of multibeam line 39.  
04:00 Start of line GA080604, heading 120° (av. speed 3.5 knots).  
04:40 Start of multibeam line 40.  
04:50 Start of multibeam line 41.  
05:49 Start of multibeam line 42.  
06:34 Start of multibeam line 43.  
07:39 End of line GA080604.  
07:47 Start of line GA080605, heading 311° (av. speed 3.5 knots).  
08:39 Start of multibeam line 44.  
08:40 Start of multibeam line 45.  
08:58 Start of multibeam line 46.  
09:45 Start of multibeam line 47.  
11:12 Start of multibeam line 48.  
11:50 End of line GA080605.  
12:00 Start transit to the Freiwald coral site for ROV dive 01 (propulsion remains electric).  
13:00 Arrival at site.  
13:54 Begin of ROV operations B08-01. ROV in the water.  
13:57 GAPS in the water.  
14:11 ROV out of TMS at 50 m below sea surface for test.  
14:14 ROV back in TMS. ROV is too light.  
14:20 ROV on deck.  
14:49 ROV back in the water.  
14:51 ROV out of TMS at 35 m below sea surface for a second test.  
14:55 ROV in TMS. Everything is ok.  
15:03 TMS is going down to 350 m (water depth 383 m).  
15:14 ROV out of TMS.  
15:15 ROV at the seafloor. The altimeter on the ROV is not working. Also no altimeter on the TMS because Sub Atlantic failed to send it to Brest on time.

18:53 ROV in TMS.  
19:15 ROV on deck.  
19:40 Switch from electric to diesel propulsion.  
19:50 Transit to multibeam area.  
20:48 Start of multibeam line 50.  
22:00 Start of multibeam line 51.  
23:38 Start of multibeam line 52.

### **Sunday 01.06.2008**

Meteo: Clouded weather with 3-4 beaufort variable wind, increasing to 5-6 beaufort NW wind. Gentle Atlantic swell.

00:00 Continue multibeam operations.  
01:31 Start of multibeam line 53.  
04:24 Start of multibeam line 54.  
06:44 Start of multibeam line 55.  
06:56 Start of multibeam line 56.  
07:27 Start of multibeam line 57.  
09:00 Transit to the area for ROV dive 02.  
09:49 Start of multibeam line 58.  
11:00 Arrival at site for ROV dive 02.  
11:20 Switch from diesel to electric propulsion.  
11:27 ROV in the water. Test at 50 m below the sea surface.  
11:40 ROV back on deck: ROV too heavy.  
11:53 ROV in the water. New test at 50 m.  
13:21 ROV out of TMS at 679 m water depth.  
15:50 Switch from electric to diesel propulsion due to ? problems.  
15:58 ROV back in TMS. Change position of the ship for part 2 of dive 02.  
17:45 ROV out of TMS at 710 m water depth.  
18:20 ROV back on deck.  
19:00 Transit to multibeam area.  
20:11 Start of multibeam line 59.  
22:37 Start of multibeam line 60.  
23:59 Start of multibeam line 61.

### **Monday 02.06.2008**

Meteo: Clouded weather with 4-5 beaufort NW wind becoming clear, slightly clouded in the evening. Some showers in the morning. Moderate Atlantic swell.

00:00 Continue multibeam operations.

00:53 Start of multibeam line 62.  
01:01 Start of multibeam line 63.  
02:55 Start of multibeam line 70.  
04:39 Start of multibeam line 71.  
05:38 Start of multibeam line 72.  
06:44 Start of multibeam line 73.  
07:00 Start of multibeam line 74.  
10:03 Start of multibeam line 75.  
11:41 Start of multibeam line 76.  
13:00 Transit to the area for ROV dive 03.  
14:09 Start of ROV dive 03. ROV in the water.  
14:17 ROV out of TMS for test at 71 m below sea surface.  
14:22 ROV back in TMS.  
14:28 ROV out of TMS at 253 m water depth.  
16:10 ROV back in TMS.  
16:21 ROV on deck. Transit to the area for ROV dive 04.  
17:05 Start of ROV dive 04. ROV in the water.  
17:25 ROV out of TMS.  
18:42 ROV back in TMS.  
19:05 ROV on deck.  
19:15 Sampling of the sponge.  
20:00 Transit to multibeam area.  
20:45 Continue multibeam operations.  
20:49 Start of multibeam line 77.  
23:09 Start of multibeam line 78.

### **Tuesday 03.06.2008**

Meteo: Clear, slightly clouded weather with 4-5 beaufort NW wind. Moderate Atlantic swell.

00:00 Continue multibeam operations.  
01:30 Start of multibeam line 79.  
04:30 Start of multibeam line 80.  
08:30 Start of multibeam line 81.  
09:10 Start of multibeam line 82.  
10:05 Start of multibeam line 83.  
11:49 Start of multibeam line 84.  
11:50 Transit to the area for ROV dive 05.  
13:03 Start of ROV dive 05. ROV in the water.  
13:07 ROV out of TMS for test.  
13:10 ROV back in TMS. Go down to 290 m water depth.

13:14 ROV out of TMS.  
16:34 ROV back in TMS.  
17:09 ROV on deck.  
19:30 Cancelling ROV dive 06 due to technical problems.  
20:16 Start of multibeam line 87.  
21:24 Start of multibeam line 88.  
21:00 Switch from diesel to electric propulsion.  
21:40 Seismic equipment into the water.  
21:56 Start of line GA080606, heading 47° (av. speed 2.7 knots).  
22:15 End of line GA080606.  
22:15 Turn 180°.  
22:21 Start of line GA080607, heading 327° (av. speed 2.8 knots).  
22:45 End of line GA080607.  
22:50 Seismic equipment out of the water.  
22:55 Transit to other area for seismic operations.  
23:45 Seismic equipment back into the water.

### **Wednesday 04.06.2008**

Meteo: Clouded weather with 4-5 beaufort SW wind. Moderate Atlantic swell.

00:00 Start of line GA080608, heading 327° (av. speed 3.7 knots).  
00:04 Start of multibeam line 89.  
00:30 End of line GA080608.  
00:45 Start of line GA080609, heading 327° (av. speed 3.4 knots).  
00:49 End of line GA080609.  
00:59 Start of line GA080610, heading 125° (av. speed 3.6 knots).  
02:26 End of line GA080610.  
02:36 Start of line GA080611, heading 260° (av. speed 3.3 knots).  
03:17 End of line GA080611.  
03:27 Start of line GA080612, heading 35° (av. speed 4.8 knots).  
04:04 Start of multibeam line 90.  
04:14 End of line GA080612.  
04:25 Start of line GA080613, heading 174° (av. speed 4.0 knots).  
06:00 End of line GA080613.  
06:05 Seismic equipment out of the water.  
06:15 Start transit to the area for ROV dive 06 (second try).  
06:30 Start of multibeam line 91.  
08:00 Arrival at site.  
08:15 ROV in the water.  
08:25 Test at 50 m below sea surface, same problem: no communication with the ROV.

08:45 ROV out of the water.  
09:00 Start transit to the area of ROV dive 03 for boxcores. Preparation for sampling with the boxcore.  
09:36 Start of multibeam line 92.  
10:50 On station for sampling site 01.  
10:57 Boxcore reaches sea floor (285 m bsl) at 46°54.514' N / 5°15.489' W.  
11:04 B08-1301-bc on deck, successful sample, transit to sampling site 02.  
11:07 On station for sampling site 02.  
11:15 Boxcore reaches sea floor (290 m bsl) at 46°54.499' N / 5°15.602' W.  
11:25 B08-1302-bc on deck, successful sample, transit to sampling site 03.  
11:30 On station for sampling site 03.  
11:38 Boxcore reaches sea floor (285 m bsl) at 46°54.511' N / 5°15.504' W.  
11:46 B08-1303-bc on deck, successful sample, transit to sampling site 04.  
12:04 On station for sampling site 04.  
12:18 Boxcore reaches sea floor (288 m bsl) at 46°54.498' N / 5°15.587' W.  
12:30 B08-1304-bc on deck, successful sample, transit to sampling site 05.  
12:57 Start of multibeam line 93.  
13:30 On station for sampling site 05.  
13:45 Boxcore reaches sea floor (288 m bsl) at 46°54.501' N / 5°15.577' W.  
14:00 B08-1305-bc on deck, successful sample, transit to sampling site 06.  
15:15 On station for sampling site 06.  
15:36 Boxcore reaches sea floor (866 m bsl) at 46°55.723' N / 5°22.828' W.  
15:47 B08-1306-bc on deck, successful sample, transit to sampling site 07.  
16:00 On station for sampling site 07.  
16:06 Boxcore reaches sea floor.  
16:21 Boxcore on deck, empty, transit to sampling site 08.  
16:25 On station for sampling site 08.  
16:47 Boxcore reaches sea floor.  
16:57 Start of multibeam line 94.  
16:59 Boxcore on deck, empty, transit to CTD sampling site.  
17:30 On station for CTD 04 sampling site at 46°54.536 N / 5°21.262 W (depth: 1450 m).  
18:20 CTD 04 back on deck. Transit to continue multibeam operations.  
19:25 Continue multibeam operations by filling in the gaps.  
19:26 Start of multibeam line 95.  
23:26 Start of multibeam line 96.

#### **Thursday 05.06.2008**

Meteo: Clouded weather with 4-5 beaufort NW wind. Moderate Atlantic swell.

00:00 Continue multibeam operations.

00:44 Start of multibeam line 97.  
01:21 Start of multibeam line 98.  
01:50 Start of multibeam line 99.  
02:10 Start of multibeam line 100.  
02:26 Start of multibeam line 101.  
04:03 Start of multibeam line 102.  
06:10 Start of multibeam line 103.  
07:31 Start of multibeam line 104.  
07:40 Stop multibeam operations. Problem to get the transducer back into the ship.  
08:00 Problem solved. Transit to the area for ROV dive 06.  
09:15 Arrival at site. Too much swell.  
09:35 Start transit to La Coruña.

### **Friday 06.06.2008**

Meteo: Clear weather with 3-4 beaufort ? wind. Moderate Atlantic swell.

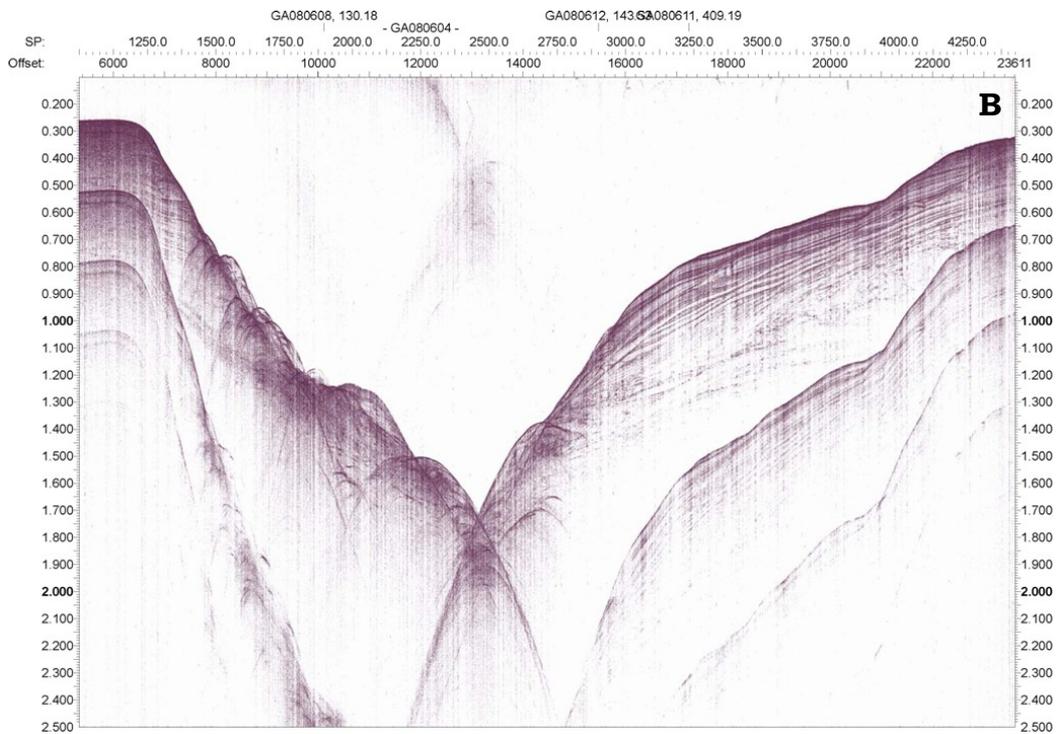
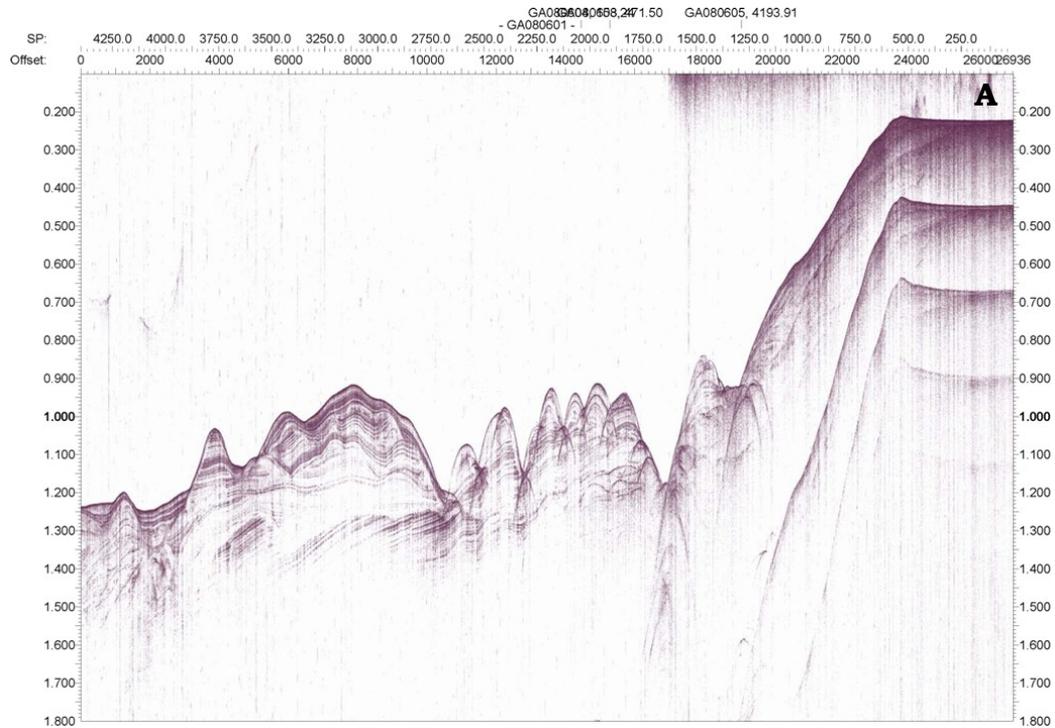
08:00 Arrival at site for the ROV test dive.  
08:15 ROV in the water.  
08:30 ROV at the bottom.  
09:10 ROV off the bottom.  
09:20 ROV back on deck.  
11:00 Arrival of R/V Belgica in the harbour of La Coruña.

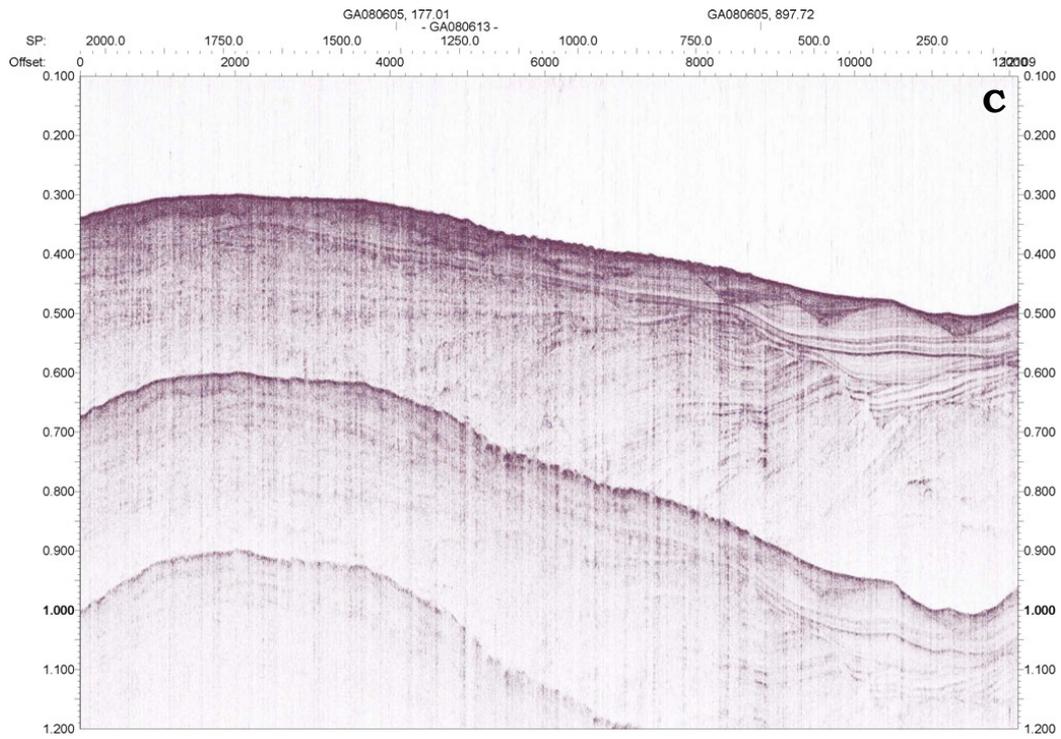
### **Saturday 07.06.2008**

07:00 Departure of Jean-Pierre Henriët, Hans Pirlet, Jens Greinert, Frédéric Quemerrais, Jeroen Vercruyssen and Koen De Rycker. Willem Versteeg, Lies De Mol, Dries Boone and Arne Baeyens will stay on board for campaign 13b.

## 5. Geological investigations: preliminary results

### 5.1 High-resolution 2D seismics



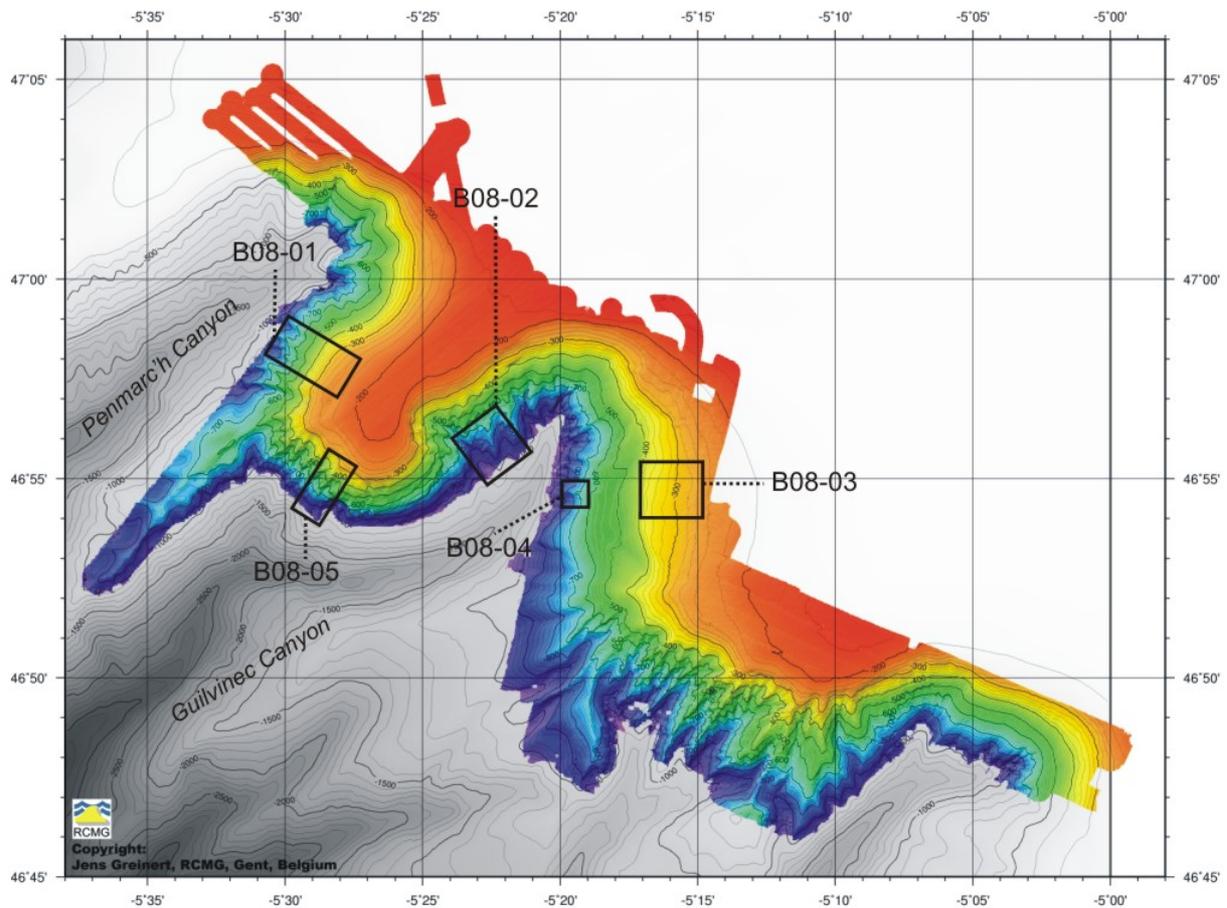


**Figure 8:** Example of three seismic profiles: **A.** GA080601 along the south flank of the Penmarc'h canyon, **B.** GA080604 across the Guilvinec canyon and **C.** GA080613 along the south flank of the Guilvinec canyon with the small mounds/ridges on the top (SP = shotpoints, Offset = distance in meters, vertical scale in seconds TWT).

## 5.2 ROV observations

The locations of the 5 ROV dives are shown on figure 9. Some preliminary remarks about the ROV observations are made here. A full analysis of the video data, including facies mapping, will be done in a later stage.

A recapitulative list of the ROV dives is given in table 1.



**Figure 9:** Location of the ROV dives.

Name	Area	Start track		End track	
		Time	Depth	Time	Depth
<b>B08-01</b>	South flank of Penmarc'h canyon	13:16:02	385 m	16:47:44	699 m
<b>B08-02</b>	North flank of Guilvinec canyon	11:24:46	712 m	15:46:00	900 m
<b>B08-03</b>	South flank of Guilvinec canyon: small mounds/ridges on the top	12:29:41	278 m	14:05:25	289 m
<b>B08-04</b>	Spur, south flank of Guilvinec canyon	15:51:10	676 m	16:38:51	691 m
<b>B08-05</b>	North flank of Guilvinec canyon	11:17:00	305 m	14:27:53	529 m

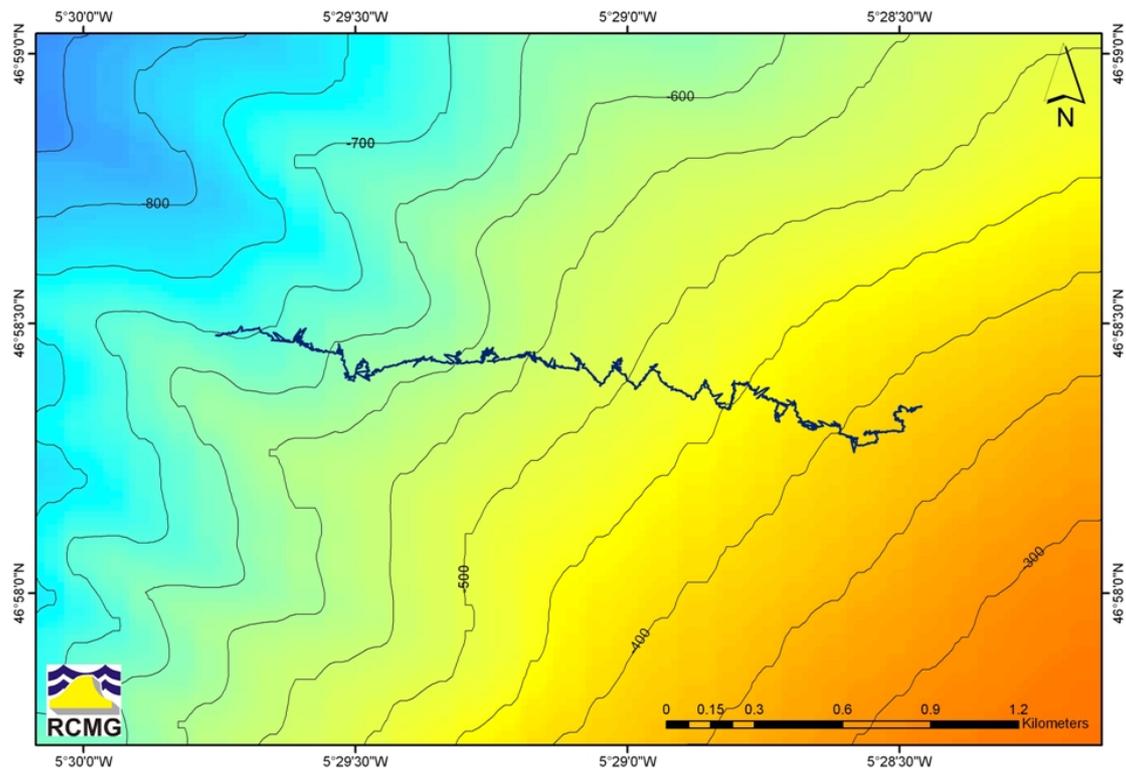
**Table 1:** Names, locations and operational data of the ROV Genesis dives. Time in UTC.

**ROV dive 01**

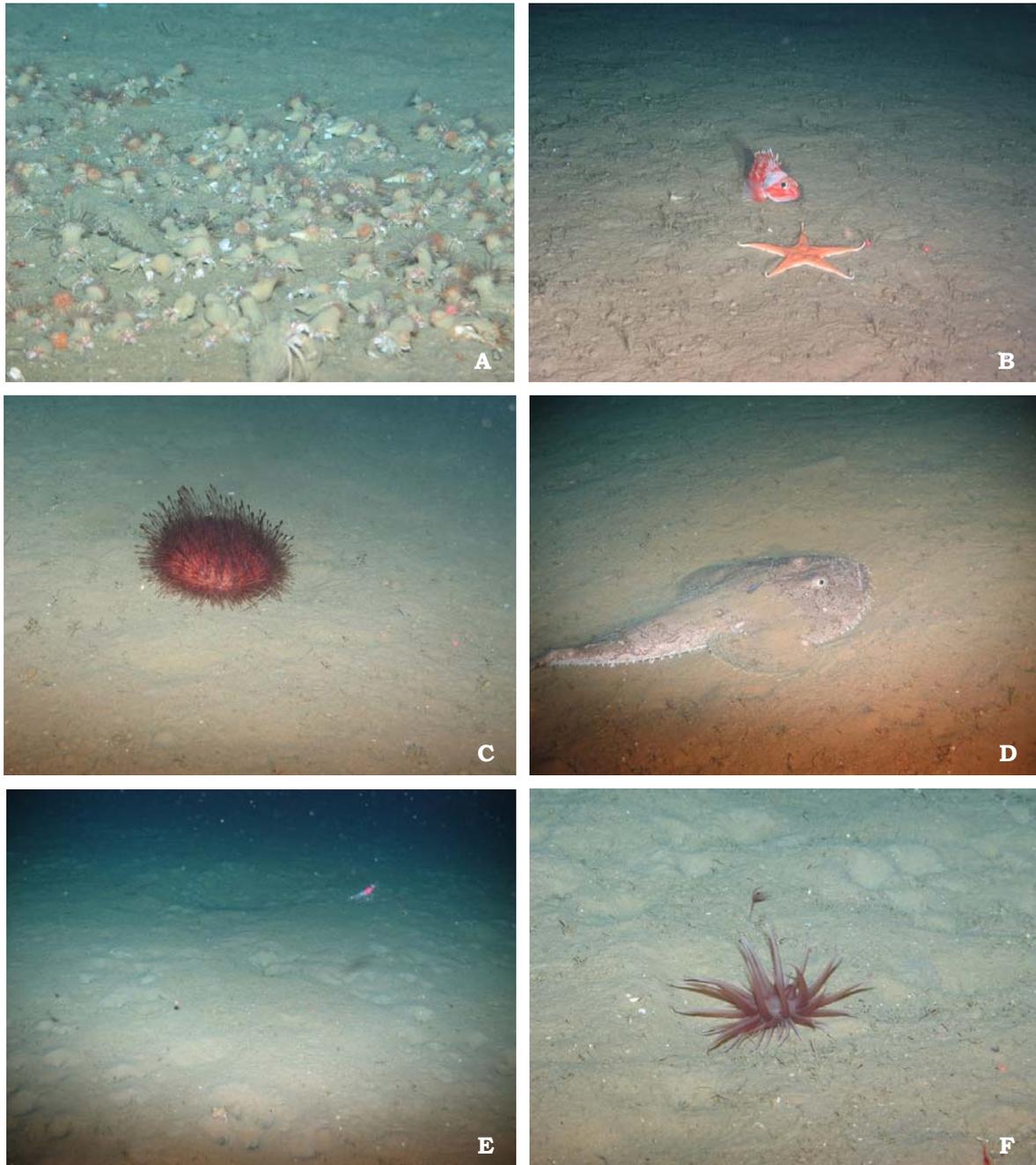
Date: 31/05/2008

Observer: F. Quemmerais

Description: The dive starts at a depth of 385 m, approximately at 46°56.277' N / 5°28.558' W. A transect downslope the south flank of Penmarc'h Canyon was made. Upslope we observed soft sediment with scattered boulders. Cold-water corals occur at a water depth of 720 m.



**Figure 10:** Map ROV dive 01.



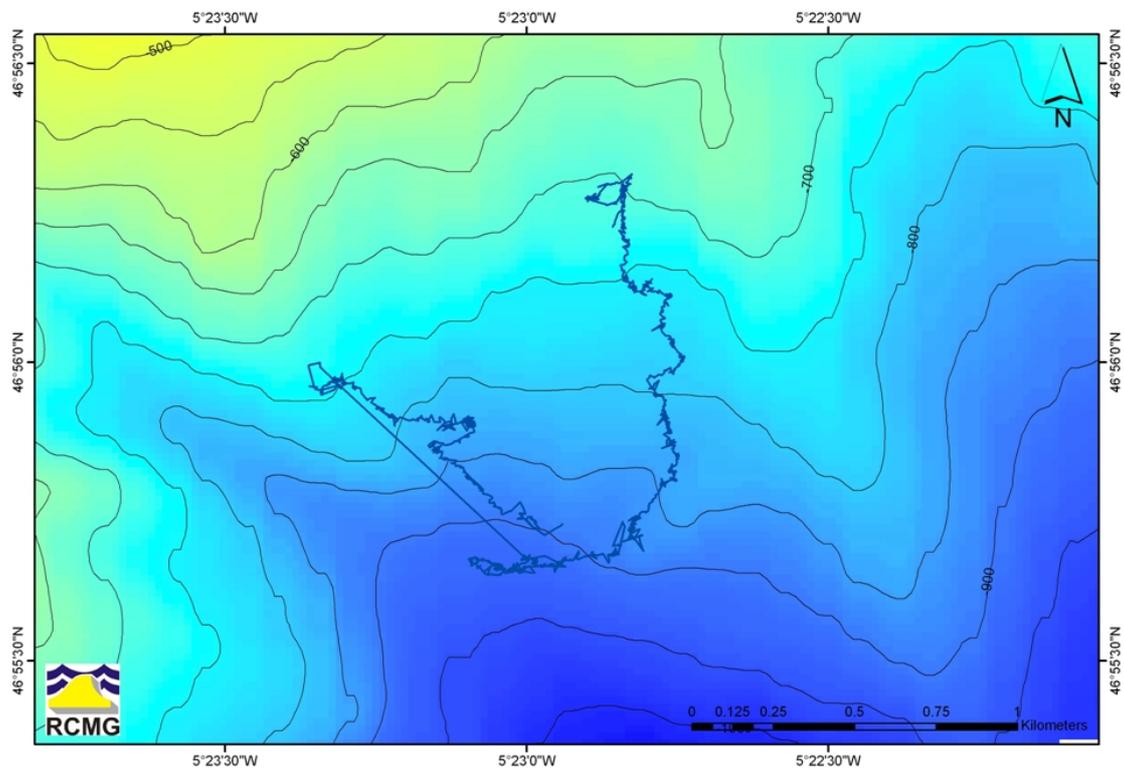
**Figure 11:** Pictures of ROV dive 01: **A.** Hermit crabs with sea-anemones (13:21). **B.** A *Helicolenus dactylopterus* and a *Astropectinidae* (sand living starfish) (15:17). **C.** A big & purple *Echinothuriidae* (sea urchin family) (15:25). **D.** A *Lophius* sp (15:32). **E.** A picture of the bioturbation at the seabed (16:17). **F.** A small and purple sea anemone, probably *Bolocera* genus (16:21).

**ROV dive 02**

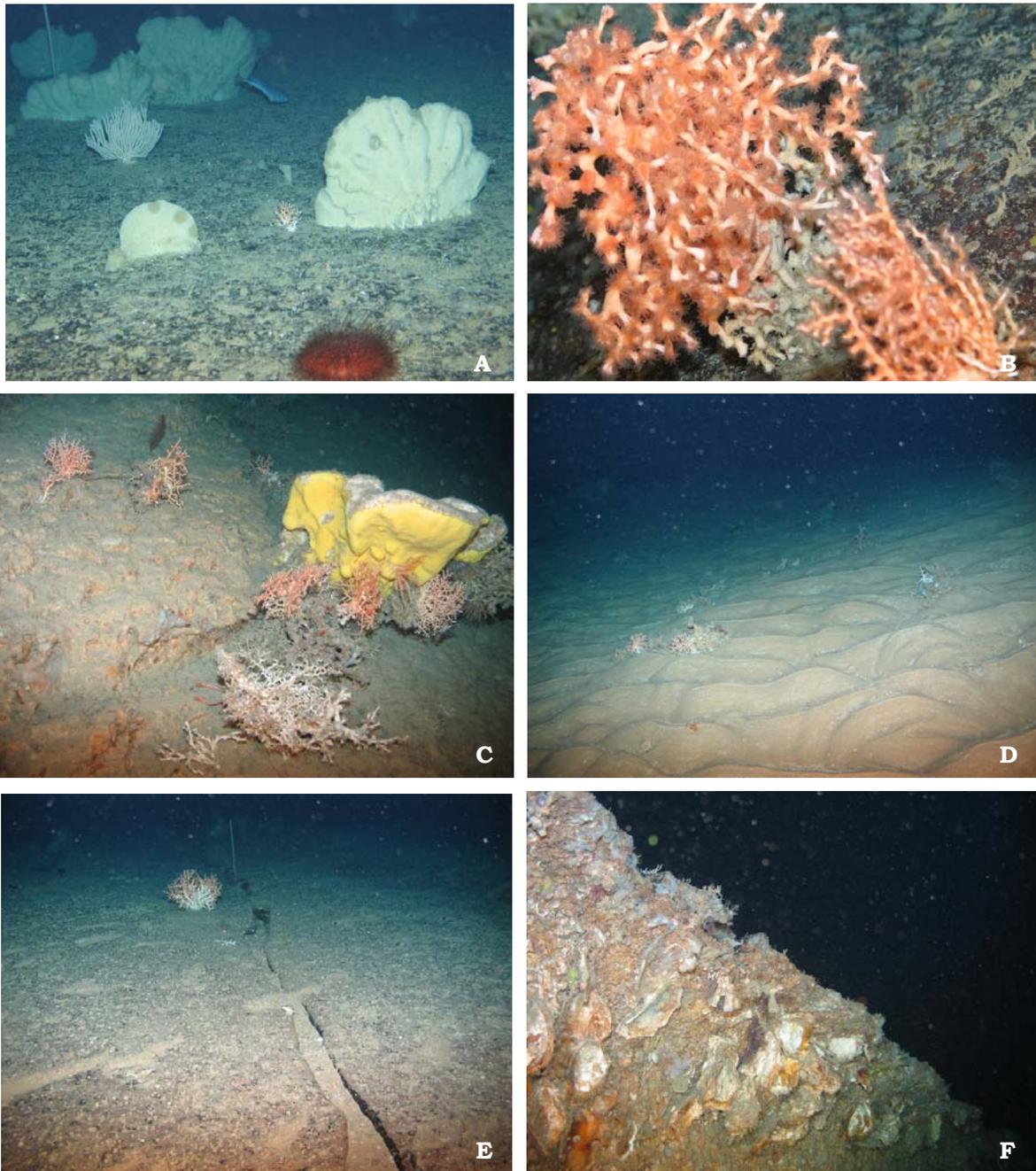
Date: 01/06/2008

Observer: H. Pirlet

Description: Start approximately at 46°56.245' N / 5°23.333' W. A transect downslope the north flank of Guilvinec Canyon was made. Around 600 m we observed the first sponges, deeper (at a depth of around 700 m) cold-water corals, both living and dead, occur. Interesting changes in substrate were observed in the deeper part of the dive.



**Figure 12:** Map ROV dive 02.



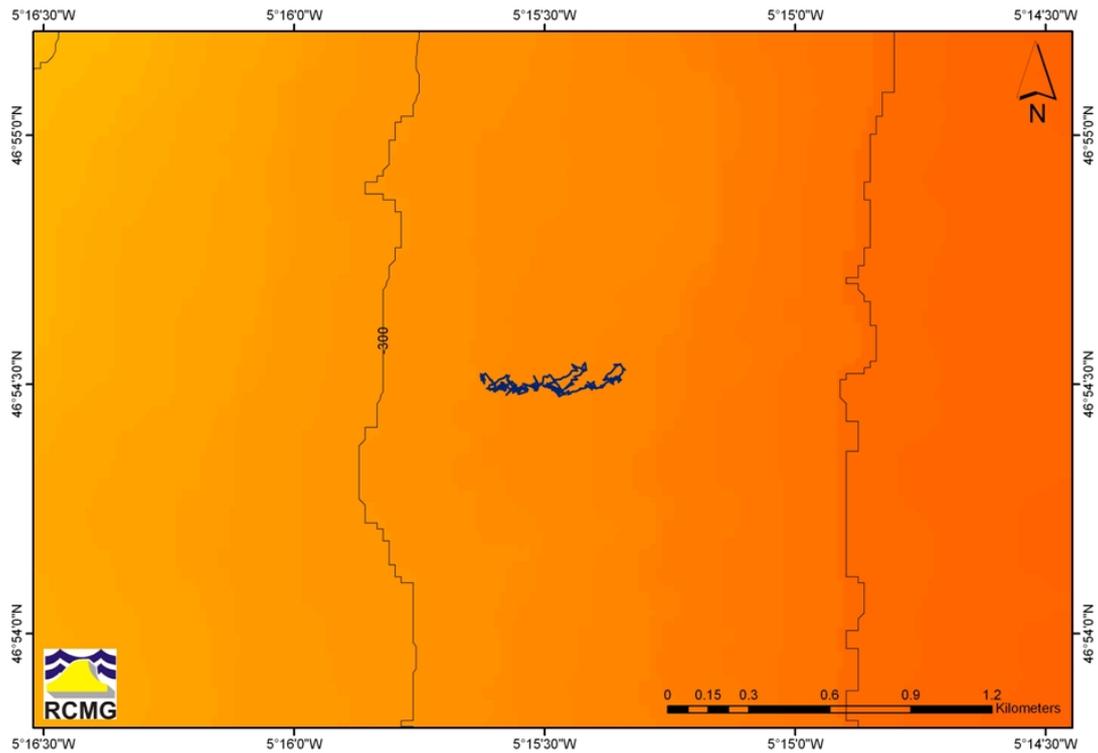
**Figure 13:** Pictures of ROV dive 02: **A.** An Overview of sponges, a sea-urchin, a soft coral and a small Madrepora (11:45). **B.** A detail of Lophelia and Madrepora on a boulder (12:03). **C.** A ridge with coral bushes and a big sponge (13:05). **D.** A sand-wave field with scattered living and dead corals (Madrepora and Lophelia) (13:23). **E.** A crack in the hard substrate filled with sand and a small bush of Madrepora (13:32). **F.** A cliff colonized by oysters (15:00).

**ROV dive 03**

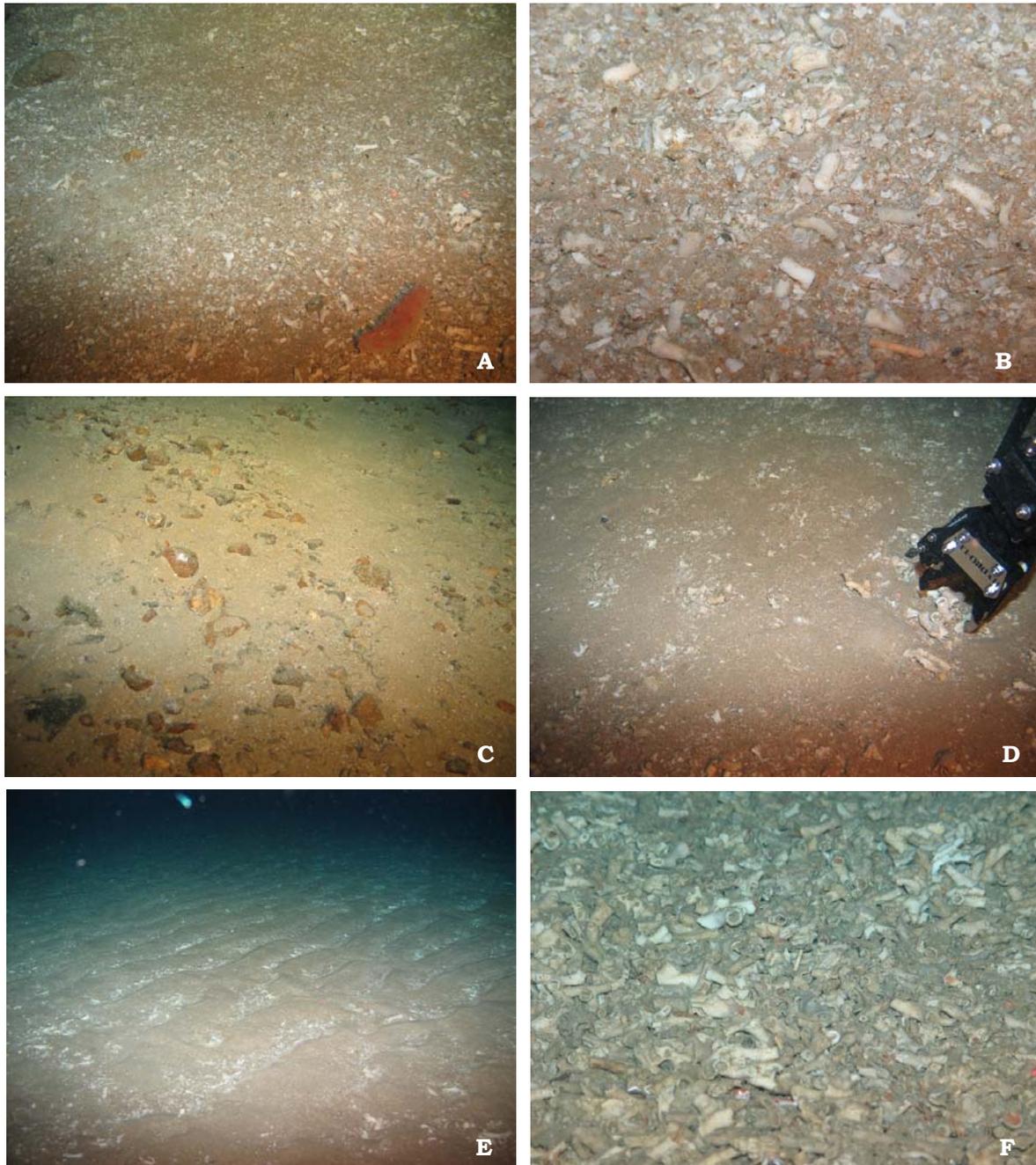
Date: 02/06/2008

Observer: F. Quemmerais

Description: Small bumps upslope the southern flank of Guilvinec Canyon (200-400 m). Two facies were observed: cold-water coral rubble on the bumps and sand with ripple marks and boulders in between the bumps.



**Figure 14:** Map ROV dive 03.



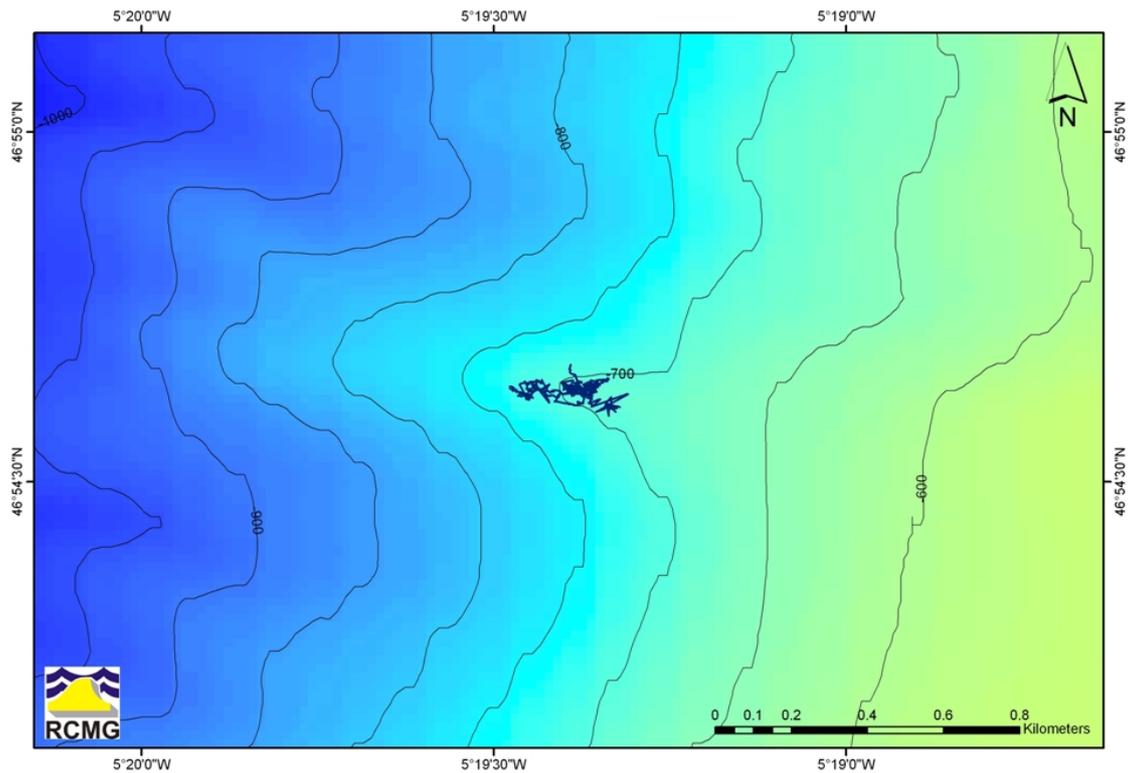
**Figure 15:** Pictures of ROV dive 03: **A.** A Holothuroidea and some coral rubble (12:30). **B.** A detail of the coral rubble (12:31) **C.** A sandy seabed with scattered boulders and rocks (12:42). **D.** The sampling of some coral pieces with the ROV (13:11). **E.** Sand waves with some coral rubble (13:18). **F.** A detail of the accumulation of dead coral rubble (13:43).

**ROV dive 04**

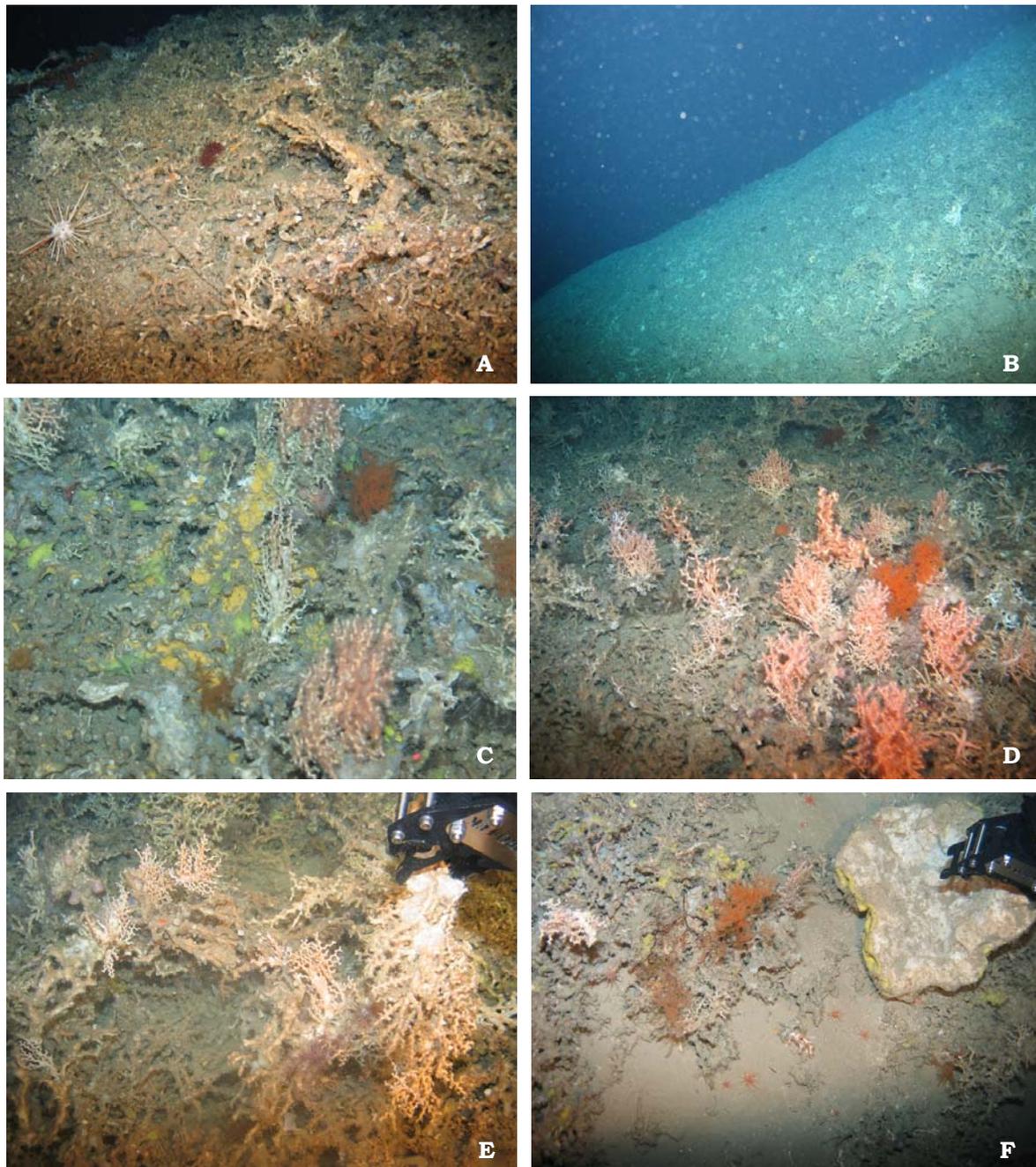
Date: 02/06/2008

Observer: F. Quemmerais

Description: A steep peak on the south flank of Guilvinec Canyon (depth approximately 670 m). This peak was completely covered by both living and dead cold-water corals (predominantly: Madrepora). Some fishing gear was observed on top of the peak.



**Figure 16:** Map ROV dive 04.



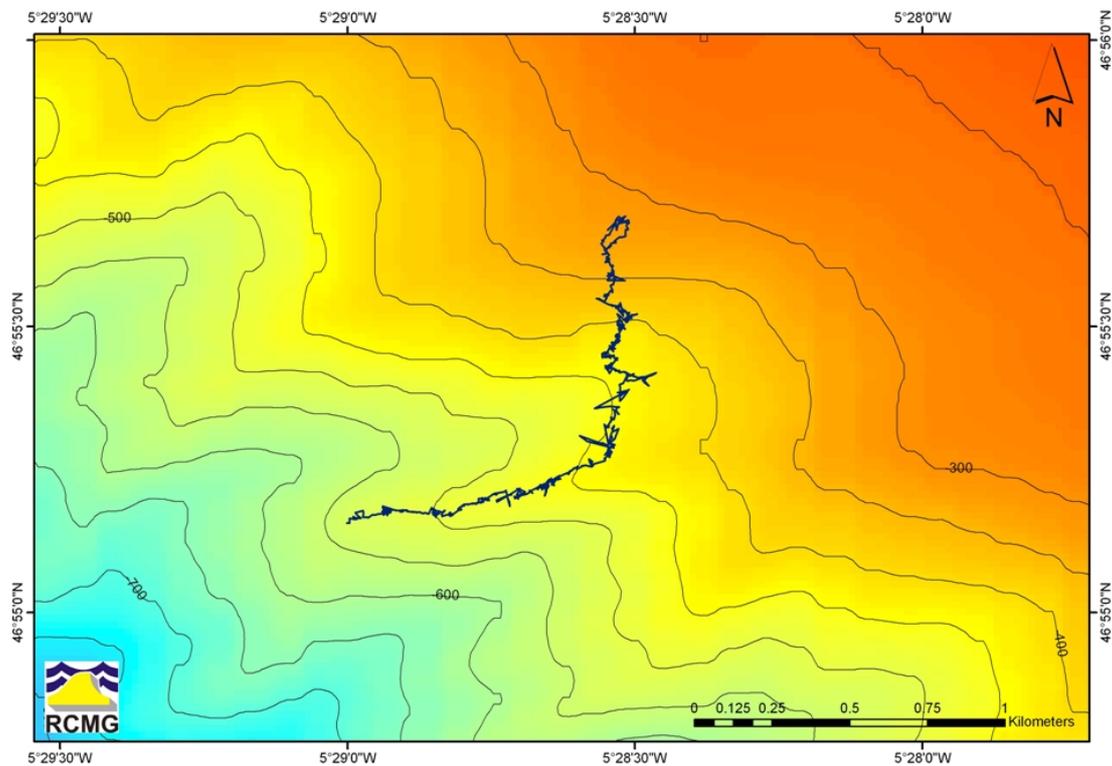
**Figure 17:** Pictures of ROV dive 04: **A.** A picture of the top of the spur completely covered by coral. There is also a steel cable (maybe towed fishing gear), a *Cidaris cidaris*, an anemone,... present (15:55). **B.** The slope of the spur covered by corals (16:05). **C.** A detail of the corals and sponges (16:08). **D.** A field of living and dead *Lophelia* and *Madrepora* (16:14). **E.** The sampling of a *Madrepora* by the ROV (16:24). **F.** The sampling of a sponge by the ROV (16:31).

**ROV dive 05**

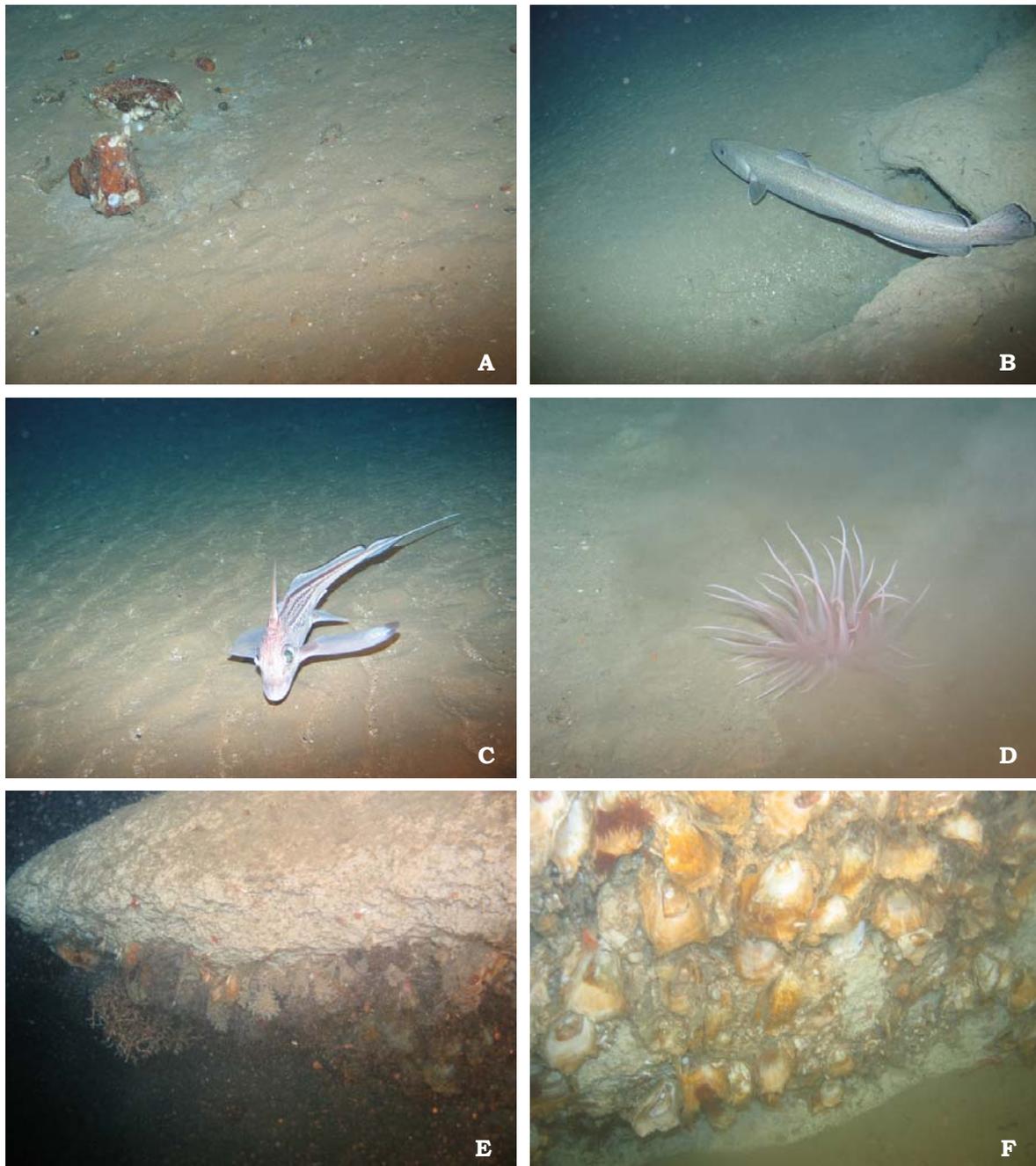
Date: 03/06/2008

Observer: H. Pirlet

Description: Start approximately at 46°55,623' N / 5°28,546' W. A downslope transect of the spur in between Penmarc'h and Guilvinec canyon. Upslope, sediment-waves with scattered blocks and numerous fishes were observed. At a depth of approximately 730 m, cold-water corals and oysters were discovered.



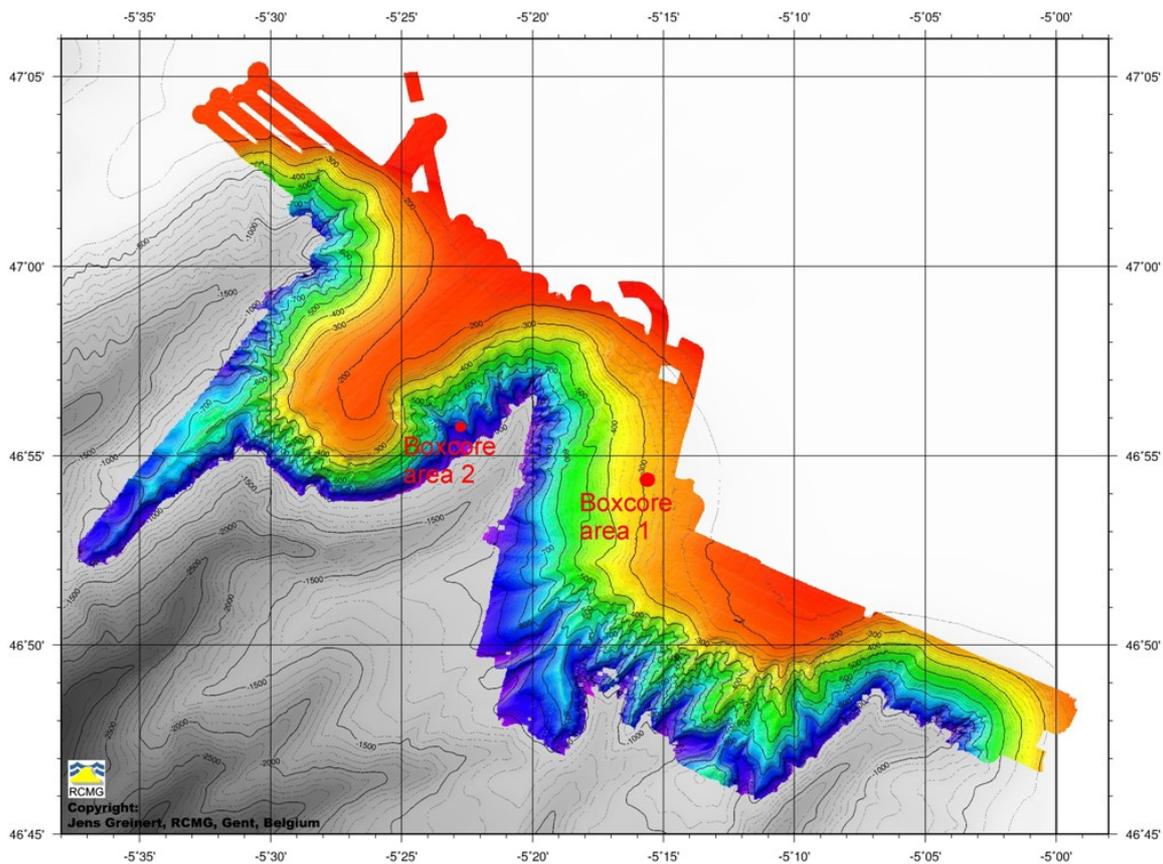
**Figure 18:** Map ROV dive 05.



**Figure 19:** Pictures of ROV dive 05: **A.** Sediment waves with moats around the scattered blocks (11:35). **B.** A *Molva molva* (11:49) **C.** *Hydrolagus mirabilis* or *Chimaera monstrosa* (12:00) **D.** A purple sea-anemone, probably *Bolocera* genus (14:15). **E.** An overhang with oysters and *Madrepora* (14:18) **F.** A detail of the oysters on the cliff (14:21).

### 5.3 Boxcore sampling

The sampled sites are shown on figure 20. As mentioned in the operational report, some boxcores failed. Here, only the successful boxcores are shown. After recovery, the bulk sample was photographed and described, respectively followed by sampling for microbiology, sedimentology and biology. A recapitulative list of boxcores is given in table 2.



**Figure 20:** Multibeam map with boxcore locations.

<b>Core number</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Water Depth</b>	<b>Recovery</b>
<b>B08-1301-bc</b>	46°54.514' N	5°15.489' W	285 m	31 cm
<b>B08-1302-bc</b>	46°54.499' N	5°15.602' W	290 m	17 cm
<b>B08-1303-bc</b>	46°54.511' N	5°15.504' W	285 m	20 cm
<b>B08-1304-bc</b>	46°54.498' N	5°15.587' W	288 m	5 cm
<b>B08-1305-bc</b>	46°54.501' N	5°15.577' W	288 m	14 cm
<b>B08-1306-bc</b>	46°55.723' N	5°22.828' W	866 m	10-15 cm

**Table 2:** List of obtained boxcores and relevant data.

**B08-1301-bc (285 m bsl)**Description surface:

Surface covered with coarse sand and biogenic debris (0YR 6/3). There are some pieces of *Lophelia* sticking out (several cm). We notice some little clay (gray-blue) fragments at the surface.

Description vertical transect:

0-15 cm: Coarse sand and biogenic material with coral fragments (0YR 6/3).

15-31 cm: Gray compact clay with black reducing spots (0YR 3/1).

Remarks: 2 subcores were taken.

**B08-1302-bc (290 m bsl)**Description surface:

Well-sorted sand with some fine biogenic debris at the surface (5Y 6/2). One coral fragment is sticking out.

Description vertical transect:

0-7 cm: Green well-sorted sand.

7-16 cm: Coarse sand with biogenic fragments (some pieces of coral were observed) and stones up to a few centimeters.

Remarks: 1 subcore was taken.

**B08-1303-bc (280 m bsl)**Description surface:

Coarse sand and biogenic debris with large, rounded stones up to 7 cm were observed at the surface. Some small coral fragments are present (1-2 cm). We also noticed a polychaet, 2 ophiurids and a seastar.

Description vertical transect:

0-4 cm: Coarse sand and biogenic debris with large, rounded stones.

4-20 cm: Gray, compact clay with black reducing spots (5Y 3/2).

Remarks: 1 subcore was taken.

**B08-1304-bc (288 m bsl)**Description surface:

We observed green, well-sorted sand with coarse biogenic debris at the surface (5Y 4/2). Some robust coral fragments of *Lophelia* (several cm) are present.

Description vertical transect:

0-5 cm: Green, well-sorted sand with coarse biogenic debris (5Y 4/2). Some robust coral fragments of *Lophelia* (several cm) are present.

Remarks: This boxcore was entirely sampled as a bulk-sample.

**B08-1305-bc (288 m bsl)**Description surface:

Coarse sand and biogenic debris were observed at the surface (5Y 5/3). We noticed also a rounded clast of 4 cm and several *Lophelia* fragments up to a few cm. Some fragments of bivalves were present.

Description vertical transect:

0-5 cm: Coarse sand and biogenic debris (Coral fragments) were observed (5Y 5/3) (oxic zone?).

5-14 cm: Coarse sand and biogenic debris (no coral fragments) were observed (5Y 4/2) (anoxic zone?).

Remarks: 1 subcore was taken.

**B08-1306-bc (866 m bsl)**Description surface:

We observed big fragments (more than 10 cm) of mainly, dead *Madrepora*, and some dead *Lophelia* at the surface. Furthermore we noticed some bivalves, needles of sea-urchins, sponges (glass-sponge fragments),... These biogenic fragments were partially buried in green well-sorted sand (2.5Y 4/6).

Description vertical transect: No

Remarks: No subcores.



**Figure 21:** Pictures of all boxcores.

## 6. Class@oceans

Class@oceans (<http://www.vliz.be/projects/classatoceansII/index.htm>) has the aim to bring marine sciences straightforward into classrooms or to bring the marine world to the youth (in cooperation with VLIZ). It gives students the opportunity to discover the oceans together with scientists. The students were introduced (by the webpage) in the concept of a scientific campaign with a research vessel (R/V Belgica) and the scientific background as well as to some scientists and people on board.

Also a daily report from the cruise was available on the Class@Oceans-website. The classes had the possibility to follow the cruise in real-time on the website and to ask questions through a forum-concept. Class@oceans fits into the educational strategies of the European project HERMES.

## 7. Data storage

During the Belgica 08/13a campaign, 13 seismic lines were acquired over approximately 135 km. All lines were recorded in ELICS format and were converted in a SegY-Motorola format with associated navigation files (these are text files containing shot point, longitude, latitude, date and time). Multibeam data is backed up on DVD: including both the 'raw' and 'proc' data folders.

A total of 6 ROV dives were performed. The ROV imagery (forward looking color camera with/without overlay) was recorded on DV tapes through Professional-DV recorders.

All data are stored at RCMG. For more information about the seismic, multibeam, video and sedimentological data, please contact

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or

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## **8. Acknowledgements**

The shipboard scientific party wants to thank the captain and crew for their tremendous efforts and the fine cooperation during this campaign. The on-board skillfulness contributed greatly to the results of this campaign.